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AIR UNIVERSITY

The AFSO21 Toolbox's Missing Tactical Tool

by

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Preface

Lean has been around a long time in the logistics community. The concept has always made sense to me, and I consider myself a "Lean believer" and one of its apostles. In assignments in both the field and at depot level, I've seen it work and I've seen it fail from the viewpoint of the enlisted technician, the junior officer and the mid-level field grade manager. In the cases of failures, I observed that it was under-resourced, unsupported or implemented in a vacuum. The problem of implementation was not at the theoretic, strategic or operational level, but in the tactical level of integrating and overlaying the new process into existing systems and processes. Oftentimes, controlling and monitoring the new Lean processes came with an additional management burden of data collection, production control, and status reporting that diminished the savings the process generated. As a result, we've never achieved the full potential of Lean or AFSO21. The ideas in this research paper suggest that modifying the current system to reflect AFSO21 elements may assist in alleviating that burden, as well as provide a systemic way of broadcasting the AFSO21 principles at the tactical level. If applied in the reengineered value streams produced in the process, the information system add-ons I advocate would make AFSO21 inherent in the system, and reinforce an AFSO21 culture on a daily basis.

I'd like to thank Chuck and Jessica Shoudel for their insights into depot operations and information management systems at Warner Robins ALC, and for providing the interviews, data and notes to make this research meaningful. Also assisting in this project were Lt Col Jeffrey Plate, Majors Scott Morris and Brian Heberlie, who instructed ACSC's AFSO21 elective seminar and elevated my viewpoint to a new level. The significant theoretic and strategic knowledge learned in this seminar will assist greatly in paving my future Lean journeys.

Abstract

This paper explores and assesses the implementation of AFSO21 at the strategic, operational, and tactical level on the Air Force's journey to transformation. Using logistics community examples, it focuses on the tactical environment where our lowest-level technicians operate on a daily basis. It provides evidence that implementation of AFSO21 initiatives at this level can present redundancies and hybrid systems that are less than efficient. As a possible solution, it introduces an alternative concept which incorporates daily tasks and the value stream in the context of an information management system. In exploring the theories of organizational change, it draws the conclusion that such systems might be able to influence cultural assumptions. This paper then provides a rationale for focusing on information systems to achieve the next level of cultural transformation. It supports this rationale with multiple organizational change models. It also supports this focus with an assessment of the Air Force's present position in the life cycle of organizational change, and provides evidence that the Air Force is at the right station to implement new technology to advance our progress. It also suggests that leaders can use information systems to influence cultural change by reinforcing AFSO21 value streams on a repetitive and regular basis.

Introduction

This paper will identify the next step the Air Force can take to achieve a higher level of progress toward Air Force Smart Operations for the 21st Century (AFSO21) goals of continuous process improvement in daily culture and operations.

Our Air Force's need to recapitalize our aging aircraft fleets has driven the development of AFSO21 as a transformational management program to concentrate value, eliminate waste, and save dollars in our processes. The initiative requires a cultural change to improve processes of the Air Force and involves the "Total Force, top to bottom."¹ Several years after the leadership, the vision, the rhetoric, the training; and the available tools have been put to use, something is still missing in institutionalizing the AFSO21 culture at the bottom level of the Air Force enterprise. This paper will argue that the Air Force is missing an important element to instill an AFSO21 culture in the lowest levels of our organization. We all know this layer of the organization is critical to the success of any endeavor. It is also the battlespace where AFSO21 will be fought and won. The Deputy Chief of Staff for Installation and Logistics, for another, believes that this level of the organization will generate the biggest dividends promised by AFSO21 when he states, "I believe that many of our most far-reaching transformational initiatives begin at the grass roots level."² To reach this level and reinforce the values associated with our organization's transformation, we must craft and implement a new tool to advance our journey. This paper will reveal that tool and its usefulness in affecting cultural change.

Main Body

*“We must fundamentally change the culture of our Air Force so that **all Airmen** understand their individual role in improving their daily processes and eliminating things that don’t add value to the mission. For such a comprehensive effort to be successful, it has to be led by commanders at all levels—from the front.”*

-Secretary of the Air Force Michael W. Wynne and Air Force Chief of Staff General T. Michael Moseley in joint 7 Nov 2005 Memorandum To All MAJCOM Commanders³

AFSO 21’s Leadership Roadmap

In the quote above, Chief Moseley and Secretary Wynne lay out the Air Force’s expectations employing Air Force Smart Operations for the 21st Century. They challenge Airmen at all levels to change culture, understand their individual roles and eliminate waste.⁴ With customary Air Force precision, the Chief targets a role for “all Airmen” and specifically charges commanders at all levels to vigorously lead the AFSO21 effort.⁵ It’s clear there is a role for every Airman, regardless of rank, title, status or level in the organization.

Strategic Level Implementation

From the top level, the AFSO21 program initiative has certainly been implemented aggressively and many success stories have been registered. Senior Air Force Leadership is certainly on board with AFSO 21, and has resourced the AFSO21 Program Office with tools to execute the Secretary of the Air Force and Chief of Staff’s vision for the program. A review of the AFSO21 website prominently positioned under the “HQ Air Force: Transformation” tab of the Air Force Portal shows the photo of a USAF brigadier general director, a doctorate-level deputy, and a host of glossy tools under its “Starter Kit and Road Show” link.⁶ Strategic tools of a comprehensive plan are evident and in place. Program rationale, values and its “Five Desired Effects” are articulated succinctly for easy printing on local bookmark paper stock.⁷ Virtual

computer space as been established for knowledge management and information sharing within the Community of Practice Collaborative Environment area, governance has been established by the Process Council Charter under Secretary Wynne’s signature, key personnel have been identified, and responsibilities assigned.⁸ The Process Council Membership reads like a veritable Who’s Who of A-Staff and MAJCOM leadership.⁹

Operational Level Implementation

At the operational level, training materials are provided and frequently asked questions answered. A robust communications plan of “Letters to Airmen” and “AFSO21 Views You Can Use” articles from and to Airmen at multiple levels are produced and published regularly.^{10,11} Most notably, a useful toolbox of implementation guidance is available—which includes The Value Stream Mapping Guide, The AFSO21 Playbook, and Continuous Process Improvement Management Tools.¹² As of this paper’s date, 134 different communities of practice have shared their successes across the Air Force’s collaboration tools, with over 1.3 million collective views or “hits.”¹³

Maintenance Milestones on The Journey

Aircraft maintenance processes are one of the most common communities of practice found on this website. The program’s top-level document, the 7 November 2005 Letter to Airmen co-signed by the Secretary of the Air Force and Chief of Staff, singles out Air Logistics Centers and Maintenance areas that have “clearly proven the benefits and potential of lean” in recent years.¹⁴ The logistics community’s ELog21 transformation campaign complements AFSO21. This campaign, established under General Jumper and Secretary of the Air Force Roche, has fully integrated its strategic-level rationale, linkage, and goals to into AFSO21

objectives. It has advanced fifteen separate initiatives to meet ELog21 goals of a 20% increase in equipment availability and a 10% reduction in O&S costs.¹⁵

There is no shortage of management advice on how to implement AFSO21 at the strategic level. However, one of the reasons for the logistics community's success is the mentorship and advice provided to operational-level managers charged with implementing Lean and AFSO21 at the tactical level. The Fall 2007 *Exceptional Release*, the professional military journal of the Logistics Officer's Association, is the latest in a long series of Lean- and AFSO21-dominated publications from this community. In examining its featured titles and authors, one can see that all officer ranks have embraced AFSO21.¹⁶ From the top to bottom of the officer corps, each of these officers are sending the AFSO21 message and submitting practical advice on implementing it at the operational and tactical levels.¹⁷ Selected titles and authors are shown below.

"As I See It," an interview with MAJCOM Commander Gen Carlson¹⁸

"AFSO21: A Journey--Not a Destination," submitted by MAJCOM colonel¹⁹

"Time To Build AFSO21 Momentum," submitted by retired group commander²⁰

"Lean Metrics: Red is Good, Green is Worthless," submitted by retired USN Capt (ret)²¹

"Thinking and Fighting As An Enterprise" submitted by a field grade team of authors²²

"AFSO21: This Isn't TQM All Over Again" submitted by company grade officers²³

Coupled with an aggressive Lean emphasis at its annual Logistics Officers Association conference, the AFSO21 message is being sent loud and clear.^{24,25,26} This is consistent with Deputy Chief of Staff for Installations, Logistics, and Mission Support, Lt Gen Kevin Sullivan's expectation for "the A4/7 community to continue to lead the Air Force in AFSO21 transformation" by completing the implementation of the major initiatives we already have ongoing."²⁷ Later in the interview he cites Air Logistics Center and base-level AFSO21 successes that have "made it clear that the entire Air Force logistics community is making great progress in implementing Lean."²⁸

Speedbumps Along The Way

Another reason the logistics community has progressed to the fore of Lean implementation may be that it has met—or at least addressed—many of the challenges to transformation. Major Harold Linnean’s research paper records several of the challenges impeding the Air Force’s implementation of AFSO21. As the recipient of the Office of the Secretary of Defense’s Transformation Award in 2007, Linnean identifies several failure points—perhaps better described as areas for improvement—that must be addressed to successfully transform the Air Force. Paraphrased, Linnean’s four failure points are: 1) the inflexibility of Air Force structure, 2) too narrow a focus on changing culture alone, 3) ignoring AFSO21 in our human resource management systems, and, 4) the failure to win over Generation TQM.²⁹ Many people in the Air Force, including Linnean, believe [the AFSO21 program] is a fad, which might soon fade away.³⁰

Admittedly, overcoming the Air Force’s structural inflexibility as an institution and bureaucracy is a daunting challenge. However, the logistics community (and the Air Force as a whole) has taken action to cross-utilize personnel to create a more flexible workforce.

In the logistics community, experienced leaders relate ways to avoid Linnean’s other failure points within our current system by carving personnel out of a rigid Air Force structure and using the existing enlisted and officer performance reports, quarterly awards, and recognition systems to encourage individual members’ cultural commitment to AFSO21.³¹ The advice and techniques published in the community’s professional journal identify practical leadership actions in implementing AFSO21, and perhaps have allowed its values to penetrate to a deeper level. With Lean initiatives and ELog21 campaign in place before the Air Force’s adoption of AFSO21, this community has a head start. Certainly, there is evidence AFSO21 has won over

those in the logistics community, including Generation TQM. Officers who were junior company grade officers during the TQM era are now in a unique position to drive AFSSO ahead.

Who Does the Driving?

Those officers, many of whom are enrolled at the USAF Air Command and Staff College (ACSC), must feel that the Chief is pointing his finger directly at them to drive Air Force culture change and transformation. These future commanders, leaders, students, and strategists, especially if they are in the logistics community or taking ACSC's AFSSO21 elective, must feel uniquely qualified to accept his mandate.

As prospective commanders at the end of the school year, the Chief identifies these leaders to lead AFSSO21 to success "from the front."³²

Students in ACSC's AFSSO21 research elective, after studying the theories behind culture change and AFSSO21 management principles, should now possess the knowledge to "change the culture" and "understanding their role in improving daily processes."³³

ACSC-trained strategists will quickly recognize the connections between ways, means and ends in prosecuting the AFSSO21 campaign. Like mid-level managers in the field, they will be the ones charged with developing the key linkages between management theory and workers' daily tasks to achieve the objective of a transformed organization.

If they are a member of the logistics community that introduced Lean to the Air Force, they should be ahead of the Air Force in AFSSO 21 inculcation, training, and experience. Between case studies, previous experience and the AFSSO 21 playbook, a majority of these officers have already been issued and used most of the tools to employ AFSSO21 effectively. They likely understand Lean theory and their discipline's over-arching daily practices, yet some

of their experiences in implementing AFSO21 have prompted reservations that theory and practice still aren't interacting with each other as efficiently as possible.

To illustrate this point, an analogy from aircraft maintenance, the Air Force's largest career fields, has been selected.³⁴

The Missing Tool Analogy

In this analogy, the deficiency can be identified by comparing the role of an aircraft maintenance manager to the experiences of a USAF aircraft maintenance technician in the first-person. Imagine, if you will, that I'm a fully qualified aircraft maintainer with several stripes and years of experience under my belt. I've been introduced to AFSO21 in formal technical school training classrooms, experienced On-the-Job Training in a variety of Air Force AFSO21 events, and have gained a confidence in my abilities to perform any assigned tasks within my specialty. Prior to my shift's roll call, I've looked in the maintenance data computer system—the official origin and authorization system for all legitimate taskings—to identify the jobs that have been assigned to my workcenter. The computer doesn't provide visibility over the overall process, but I trust that someone in my chain of command has aligned my workcenter's activities to fit into the critical path of events required to achieve maximum aircraft availability. I've coordinated my daily tasks internally and determine their appropriate priorities for the day. I've been issued the appropriate toolbox and technical manuals from the Composite Tool Kit section to carry out my duties. Optimistically, I've high-stepped to the flightline to put my shiny tools to work on the complex and interrelated systems of a sophisticated aircraft. I'm a professional, fully trained technician and approach my task with fire-and-forget precision. On arrival at the jet, I'm confident I now have clear guidance, the authority, the training, the tech data, and the

basic tools to do the job. I've done this job a few times before, and doing it again, I am reminded that **some special tools** would help do this job more efficiently.

Instead--in true knuckle-buster form--I accomplish the task with extra measures of sweat, motivation and innovation using the primitive tools I've been issued. In other words, I've reached for a "bigger hammer" to get the job done. If I had the time, I'd submit a suggestion through the IDEA program, thinking maybe we could purchase the special tools I dream of with some fall-out money. Instead, I've continued to improvise with an assortment of disparate time-consuming and home-grown 'special tools' to perform the task. It seems that every workcenter in which I've been assigned has solved this problem differently. I sure wish I had been issued a flexible, durable and standardized special tool to ease this repetitive task the next time it comes around. Eventually, I've concluded I have a missing tool in my toolbox!

The Analogy Explained

In Foreign Object Damage (FOD)-conscious communities on our flight lines, the detection of a missing tool typically requires an immediate shutdown of flying activities until the tool is found or isolated.³⁵ In the context of AFSO21, there's no need to initiate an enterprise-wide shutdown of operations until we find this elusive tool. However there is a need to develop the special capabilities to institutionalize AFSO21 principles in our daily operations at the tactical level—the level where this technician operates every day. To better understand this analogy in leadership and management terms, several of its key elements are compared below.

Complex Weapon System = Complex Management Systems

As a logistics manager, the job of managing the inter-related schedules and functions of multiple skill sets and organizational interfaces within scheduled maintenance processes can be compared to the inter-related (and often redundant) hydraulic, electrical, avionics, and

mechanical systems of today's sophisticated aircraft. The C-5 Isochronal Inspections process, for example, directly involves up to five squadrons, and are touched by the hands of up to 200 different technicians in more than twelve specialties.^{36,37} In the field of logistics, there are over 420 separate information systems in use supporting over 250,000 end users, most of which reside at the tactical level.³⁸ In aircraft systems maintenance as well as logistics management, each subsystem impacts the performance of the weapon system as a whole. Management functions also must operate within a system of systems to create value for our warfighters, and doing so effectively requires training.

Technical School = Formal LEAN Training

Through formal training courses conducted by several consultants, Lean leaders have been formally schooled in the concepts of Total Quality Management, Theory of Constraints, Lean, Six Sigma, and Business Process Reengineering. These students have read the textbooks of AFSSO21 and have studied their principles. The knowledge gained in these classroom training environments is the "Tech School" referred to in the analogy. Some consultants have also conferred the degree of 'yellow belt', 'black belt', or similar phased levels to identify those qualified as Lean warriors.

OJT = LEAN Experiences

"The benefits of Lean have been clearly proven in our Air Logistics Centers and in some maintenance areas over the last 4-5 years."

--Secretary of the Air Force Michael W. Wynne and USAF Chief of Staff General T. Michael Moseley in joint 7 Nov 2005 Memorandum To All MAJCOM Commanders

Aircraft maintainers at both the field and the depot levels must agree with the Secretary and Chief's assessment of the value of Lean in the maintenance community, where it has been applied and proven for nearly a decade. This arena is the "On-the-Job Training" referred to in

the missing tool analogy, where leaders have participated in or led successful Lean events. In the analogy, these events are the “stripes on [the technician’s] sleeves” and the “years of experience under [the technician’s] belt” that inspire the leader’s confidence to press forward in search of processes ripe for evaluation using AFSO21 tools and techniques.

Assigned/Authorized Task = The AFSO21 Mandate

Like the technician departing roll call, the task assigned by the Air Force’s work leader at the top of the chain of command has also been clear. In his August 2006 CSAF Vector message to Airmen, General Moseley states: “We also expect our Air Force Smart Operations for the 21st Century (AFSO 21) programs to *further* optimize our *daily business practices and processes* to get at *eliminating unnecessary or non-value added work*. The objective here is to allow us to work smarter, not harder, and to cut contract and operating cost and translate these savings directly into *increased combat capability* while freeing more resources for recapitalization and modernization.”³⁹ The logistics community’s ELog21 campaign has translated “increased combat capability” into increased aircraft availability and cost reduction goals.⁴⁰ The way to achieve these goals is to optimize our processes using AFSO21 tools and imbedding AFSO21 values in our culture.

Enterprise Task Alignment = Culturally Someone Else’s Job

The technician in the analogy hasn’t really needed to worry about optimizing the overall processes before the advent of Lean and AFSO21 and its emphasis on an enterprise-wide perspective. Consistent with the automobile manufacturing industry early this century, the planning of the best flow of operations was elevated to a new breed of industrial engineers consolidated in departments at the upper echelons of the organization. In the 1920s, Alfred Sloan’s highly successful reorganization of General Motors revolutionized the automotive

industry by centralizing common and specialized functions at the corporate level.⁴¹ In Sloan's new structure, industrial engineers arranged the processes and operations in the most efficient sequence, and unskilled employees executed simple and repetitive tasks of assembly line labor.⁴² There was no need for the assemblyman to think—his role was to execute the assigned task the way the engineer laid it out in the technical manual.⁴³ Similarly, remnants of this revolution and rigid technical data requirements tend to elevate the responsibility for efficiency away from the lowest levels of our Air Force technicians and up to the SNCO (and above) levels of our specialized and stove-piped communities. Incidentally, it was in this environment that many of our Air Force legacy information systems were born.

According to concepts laid out in *The Machine That Changed The World*, reversing this mindset and the culture it has created in the systems at the tactical level is the key to success. The Business Process Reengineering textbook, *Reengineering the Corporation*, concurs, advocating the value of worker empowerment in a transformed organization by stating, “Instead of being separated from real work, decision-making becomes *part* of real work. Workers themselves now do that portion of the job that was formerly performed by managers.”⁴⁴

Tech Data = AFSO21 Playbook

Most Lean managers in aircraft maintenance have led, coached, or chartered multiple Lean events “by the book,” and applied the five principles of Lean—Value, Value Stream, Flow, Pull, and Perfection--in many industrial processes.^{45, 46} And after reviewing the AFSO21 Playbook, they've streamlined value streams, sketched spaghetti diagrams and extensively debated the meaning of value-added and non-value-added tasks. As a leader, they've executed steps in accordance with the in the same way that the aircraft technical manual job guides the

maintenance technician in performing every task step by step.⁴⁷ These references and many others provide the set of “shiny new tools” in the manager’s toolbox.

Basic Tools = Aircraft Maintenance Information Systems

So what is the point? How do we empower our Airmen? What is the missing tool? I’m confident it is still unclear at this point. To further reveal it, I must relate what management tools are already in my toolbox—in the form of information systems and policies—and are currently in use by technicians on the front lines of flight line and back-shop maintenance.

The heart of all maintenance status and effort is the aircraft forms binder--a manual information system consisting of a collection of physical documents that identify the aircraft, its current ability to perform the mission, minor or major discrepancies which require correction or inspection, and upcoming inspection and/or component replacement schedules.⁴⁸ Ultimately, the discrepancies entered in the forms binder by ground crews, aircrews or management (once validated with the assignment of a unique work authorization number, called the Job Control Number) become the official source of all maintenance actions.

The aircraft forms binder system is complemented by the Maintenance Data Collection (MDC) system, an electronic information system which, in its basic function, mirrors the manual entries made in the aircraft forms binder information system. While the manual aircraft forms binder system is used to initiate and track work orders on site at each aircraft, the electronic system completes the work cycle by capturing the final action(s) taken, the type of malfunction, the personnel who performed the action(s), and the man hours consumed in the process of correcting the discrepancy. By collecting the data elements of job control number, type of maintenance, discrepancy, corrective action, work unit code, malfunction code, when discovered code, action taken code, employee number, crew size, and other fields of information

electronically, this system becomes the official historical record of all work performed on the aircraft for analysis at local, MAJCOM, depot, and Air Force levels.⁴⁹

Together, the aircraft forms binder and the MDC systems drive the actions at the lowest level of the aircraft maintenance communities across the Air Force. In much the same way that the Theater Battle Management Control System drives the Air Tasking Order, the entries in these systems become the tasks assigned to workcenter technicians at the start of each shift cycle.⁵⁰ As illustrated in the missing tool analogy's roll call job assignments, I contend that these systems are at the heart of aircraft maintenance and drive the "daily practices and processes" the Chief refers to in his AFSO21 mandate.⁵¹ This is the tactical level of AFSO21 implementation.

The Bigger Hammer = AFSO21 Improvisation

The "bigger hammer" referenced in the analogy is that extra effort required to implement AFSO21 initiatives. Experience in the field level has found that it takes out-of-hide resources to implement, educate, and influence the process being leaned. After the new process is debated and established during the Lean event, the new value stream must be applied in the workplace. Each of the individual operations represented by the many yellow sticky notes on the conference room wall must then be converted into sequential daily operations of each workcenter.

Thereafter, executing the new process usually incurs over-and-above operating costs, primarily in the form of management and administrative costs. These costs are realized in the maintenance of a manual production management display boards, updating electronic off-line databases, reporting process status, or building interfaces with official systems of record. In many cases, the information duplicates information and the required entries found in official information systems. Perhaps you have also experienced examples of manual or "homegrown" personnel, production, or scheduling systems found in your community as well. Such systems

are prevalent. And if they are unsupported, unfunded, redundant or not integrated into formal systems, the maintenance these systems require is waste!

This is true at the depot level as well as field level. Consider WR-ALC's investment in Concerto™ software, a Critical Chain Project Management program used to monitor one of the Air Force's most-vaunted and award-winning Lean success stories, C-5 Periodic Depot Maintenance flow day reduction.⁵² The contract implementation of the Theory of Constraint methodology in the Concerto™ system includes the software and consultant(s) needed to operate it. Air Force first-line managers are required to update Concerto's™ tracking/status system, and then make identical entries into the systems of record, which ultimately drives the worker's activities. In other words, the value of the initiative is offset by the requirement to overlay it on the Air Force day-to-day management system.

Tactical Friction and Maintenance Culture

Resistance to this additional effort is part of human nature and a natural part of the cultural resistance to AFSO21. Our technicians love their jobs and are good at it. Many joined the Air Force to do exactly what we ask them to do—maintain systems to keep the world's most respected Air Force flying. They can be trusted to do the right thing and to make the proper decisions to make the mission happen. Today's Airmen are smarter and more inquisitive than previous generations and are increasingly proficient with new technology. They love making hands-on contributions to the mission and to seeing the tangible results of their labor. Our maintenance technicians certainly know how to maintain our aging airplanes, but the “red tape” task of data collection is often an additional and neglected chore. Flawed data entry in maintenance data systems has warranted establishing an expensive data integrity program and policy to police the accuracy of data collection.⁵³ Duplicating the entry of such data makes it

even less palatable to the average wrench-turner. Especially if it's required to satisfy some new management program that is thrust upon them and the results are nebulous or invisible.

The Missing Tool Identified

It is here, at the intersection of the day-to-day management system and the value stream where the missing tool belongs. The Chief's AFSO21 mandate to "get at *eliminating unnecessary or non-value added work*" implies that managers have the means to analyze the daily processes and identify unnecessary or non-value added operations in my work.⁵⁴ However, this is not so. If so, management at tactical and operational levels wouldn't need to hold Lean events to debate the virtues of each operation in the overall value stream. Like the technician in the trenches, managers have access to the same management information systems to identify the maintenance actions that need attention and the capability to document the maintenance actions completed. However, the key elements of how they relate to each other, where they fit into the overall priority in the value stream, or which actions need to take place next to stay on the critical path are absent in these information systems. Additionally, the existing system requires manual status reporting as the process progresses through the value stream. In other words, managers don't have a real-time, rolled-up view of the value-stream critical to success. As a result, managers and workers don't see AFSO21 principles and underlying values reflected in the system in use on a daily basis.

The Redundant Role of the Expeditor

Thankfully, we have seasoned Non-Commissioned Officers who are adept at performing the mental gymnastics of juggling requirements, resources, and priorities exceptionally well. Using systems of clipboards and mobile status boards maintained in parallel (need I say redundant?) to official systems of record, these maintenance professionals anticipate shortfalls

and issue the appropriate guidance to the technicians at the job site to complete the mission. The Air Force has recognized their functions in our formal organizational structures with duty titles of “Expediter” and the more senior “Production Superintendent.” However, according to Womack and James, employees in these types of positions may be performing duties that compensate for the inefficiencies of an unresponsive prioritization system. In their book, *Lean Thinking*, authors Womack and James describe increasingly complex and cumbersome information systems that required “every firm’s [info] system to be supplemented by a back-up system of expeditors moving through the production system to move parts in urgent shortage downstream to the head of the queue in every department and at every machine. Their efforts, while essential to avoiding cancellations or large penalties on overdue orders, played havoc with the internal logic of the [info] system...”⁵⁵ The Air Force’s need for personnel in these “back-up systems” to execute the mission implies that Air Force systems may also be too cumbersome and contain some redundancies (read as waste) worth investigating. If ‘the system’ could display what’s next, its priority, and its relationships to other tasks in the value stream, our increasingly smart Airmen at the lowest levels could be empowered to make the right decision at the right time—a notion completely consistent with AFSO21 concepts of empowering our Airmen. If implemented properly, the Alfred Sloan-style of assembly line workers could be replaced with a set of empowered, decision-making workers informed by an intuitive and predictive information system--without the need for expeditors!

Intelligent Systems

The book *Lean Thinking* provides a simple example of such an informed and empowered system by employing the analogy of an airline transportation system.⁵⁶ If you look at an airline, the business goal of the company is to create value by transporting cargo—in the form of human

passengers—from a selected origin to a desired destination. To do so, the airline industry has created a distribution system of logistics terminals called airports. The cargo—intelligent human decision-makers—are given the training and vital pieces of information to navigate the system in the form of date, times, flight numbers, gate numbers, destinations, seat assignments, etc. Inside the system, the intelligent decision-maker self-sorts and moves themselves through the value stream operations of ticketing, check-in, staging, boarding, deplaning to reach the desired destination. Sometimes, hiccups in the system necessitate diversions and delays, but the passenger can make decisions to select alternate routes, airlines, departures, or dates to reach the desired destination with limited intervention by airline management. The concepts in this analogy can apply to processes within the Air Force systems as well. Given any system, like a scheduled maintenance inspection process, workers within the value stream system—once provided the system framework and the right information—can be empowered to reach the appropriate destination.

Information System Shortfalls

Current maintenance management information systems have proven effective in tracking individual operations (i.e., discrepancies and inspections) for decades. Like many Air Force systems, they were developed long before AFSO21. However, these field-level systems (specifically, the Core Automated Maintenance System for Mobility/GO-81 system) do not have the capability of networking a large number of related tasks in a sequential or parallel series of events reflecting the value streams and flow plans produced in major Lean events. They don't possess the data fields which characterize the operations as dependent upon other tasks, which operations are capable of being accelerated by more manpower, which are value-added (or

conversely, non-value added targets), or the ability to provide enterprise-wide visibility and transparency to ease reporting on a real-time basis.

The Key Link

What's needed is a system that links the daily operations of our technicians with the value streams of our enterprise. Such a link would effectively bridge the gap between the strategic enterprise, the operational value stream and the tactical task. On a macro scale, the key data element linkage could be a mission number, transportation control number, or a host of any other control numbers representing individual operations or processes within the Air Force's major value streams. In the computer databases that comprise many of our information systems, this linkage is referred as a relationship. Relationships between key elements of different tables or systems are used to fuse information. On a micro scale, as in our missing tool analogy, this number could be the maintenance data collection system's Job Control Number. Key data elements of the maintenance data collection system are depicted on the right side of figure 2. below. The figure's left side shows notional value stream data elements based in part on examples of a card recommended in the AFSO21 Value Stream Mapping Guide. The line connecting the two tables indicates a possible relationship that could fuse information in these two systems.

AFSO-21 ELEMENTS		MAINTENANCE DATA ELEMENTS	
IDENTIFICATION		IDENTIFICATION	
Key/Linkage	unique number corresponding to system of record	Job Control Number	
Operation Name	name of task defined in Lean event	Aircraft Tail Number	
Operation Description	description of the task	Workcenter IDr	
Key Issues/Restrictions	user-defined entries	Discrepancy	
Effect	user-defined entries	Corrective Action	
Notes	considerations	How Malfunction Code	
VALUE STREAM DATA		When Discovered Code	
Trigger Event	what must occurs to initiate the task	Action Taken Code	
Completion Event	what must occur to terminate the task	Type Labor	
Status	complete/incomplete/in-progress	Crew Size	
Process Level	level identification in scheme of nested levels	Employee #	
Parent Operation	operation # of task driving this operation		
Child Operation	operation #(s) of required subtask(s)		
Critical Path Impact	answers how this operation impacts the flow		
Normal Variability	six sigma variation measurement		
"Show Stoppers"	user-defined entries		
Dependencies	none, authority, manpower, facilities, equipment,...		
Value-added	(V) Value-added		
	(NVAR) Non-Value Added, but unavoidable		
	(NVA) Non-Value Added		
RESOURCE REQUIREMENTS			
Authority	permission or direction to begin/end		
Manpower	# of personnel, skill-levels		
Facilities	hangars, parking,		
Transportation	special/general purpose vehicles required		
Equipment	ground equipment, test equipment		
Systems	support systems		
Tools	special tool requirements		
Other user-generated options			
PERFORMANCE/METRICS			
Flow Time Allotted	estimated time to complete operation		
Touch Time Required	actual time to complete task		
Yield			

Figure 1. Possible Linkages of AFSO21 and Value Stream Data Elements

The Awareness Tool

Linking operations to value streams with such a relationship could provide an awareness of the value stream made visible at the lowest level of our Air Force. At this point—literally, at every terminal on the shop floor—such a system would provide an unprecedented level of awareness of the overarching value stream. Awareness and information is a critical element in today’s technologically savvy workforce working at the tactical level. Armed with the value stream information, today’s intelligent technicians can take an active role in self-managing the flow of operations. In addition, it would assist greatly in the analysis and future refinement of our evolving value streams as our AFSO21 journey continues. It also will have a hidden effect of creating and sustaining a long-term AFSO21 culture.

Why Info Systems? Why Now?

There are two significant reasons why this awareness tool, in the form of information technology, needs to be the next tool issued to our Airmen—1) the need for a focal point, and 2) it’s the next step logical step in our journey.

The Need for Focus

Managing within any Air Force’s “system of systems” is complex proposition. The many moving parts, people, and planes involved in Air Force maintenance and logistics activities can be overwhelming to even the most experienced managers--especially those seeking to affect change in culture or significant processes. Narrowing down an operational area or process on which to focus Lean efforts is difficult. Like the organizations in the book *Lean Thinking*, many managers have been part of an organization which made “...very little progress because they went tearing off in a thousand directions and never had the resources to get very far along the

path.”⁵⁷ Perhaps you have, too. Many can relate to Linnean’s comment that “Random unplanned forays for closing this gap [between present and optimum], are discouraged because it is easy to become lost, overwhelmed and discouraged.”⁵⁸ To avoid this, the authors of *Lean Thinking* encourage us to pick our projects carefully. “The most successful firms,” they state, “have learned how to ‘deselect’ projects, despite the enthusiasm of the organization.”⁵⁹

The Next Step in Affecting Cultural Change

AFSO21’s Three Elements of Transformation

Additional support in identifying the missing tool as information technology can be found in the AFSO21 Playbook’s Three Elements of Transformation. The first element is the **Operating System**, or “the physical tools and techniques to create value and minimize losses.”⁶⁰ In the maintenance technician analogy, this is directly compared to the hand tools, parts, and tech data used to complete the task.

The next element, **Management Infrastructure**, is defined as “the formal structures, processes, and systems through which the operating system is managed to deliver warfighting capability.”⁶¹ In the missing tool analogy, this correlates directly to the maintenance information systems and policies described in the paragraphs above.

The final element is **Mindsets and Capabilities**, described as “the way people think, feel and conduct themselves in the workplace, both individually and collectively.”⁶² Other than the optimism and confidence of the analogy’s Airman, the analogy doesn’t extend to this final element, but it’s a vital and hidden part of the overall Air Force culture and the ability to imbed AFSO21 in our management infrastructure and operating systems as explained by Schein’s theories below.

Background--Schein's Levels of Organizational Culture

All three of these AFSO21 transformation elements align directly with the ideas of Edgar Schein, a well-known organizational behavior analyst. According to Schein, organizational culture is reflected at three different levels. At the surface **Artifacts level**, visible objects and behaviors exist in the form of procedures, uniforms, language, products, charters, organizational charts, posters, and rhetoric.⁶³ Bolstering this level is the underlying **Espoused Beliefs and Values level**, which yields the socially validated policies formed by common history and experience.⁶⁴ Put simply, it is the difference between the organization's rhetoric and its reality, the "difference between what people say and what they do." In turn, those written and unwritten policies are formed by the deepest foundational level of the organization's **Norms, Values and Assumptions level**.⁶⁵

SCHEIN'S PYRAMID	AFSO21 PLAYBOOK
Artifacts	Operating Systems
Espoused Beliefs and Values	Processes and Systems
Underlying Assumptions	Mindsets and Capabilities

Figure 2. Alignment of the AFSO21 Playbook with Schein's Pyramid

© Copyright E.H. Schein, *Organizational Culture and Leadership*⁶⁶

Schein's pyramid framework can be used as a roadmap for affecting change within organizational culture. In Schein's view, the way to change the culture of an organization is to challenge its deepest assumptions.⁶⁷ He believes that any changes to the assumptions or values of a culture will then influence change in its underlying policies and systems, which will in turn manifest itself in the organization's artifacts.⁶⁸

Extending Linnean's Argument

Harold Linnean's pitfalls of AFSO21 implementation provides evidence that AFSO21 cultural change has not permeated to the bottom of Schein's pyramid. He argues that if the Air Force truly accepted AFSO21 values as a basic assumption, we'd see evidence of it in our awards systems, performance feedback and appraisal systems, as well as in the visible artifacts of daily activity.⁶⁹ By extension, I'll extend his argument an additional step and maintain if the Air Force truly wants to embrace AFSO21 principles, we'd see more evidence of it reflected in our management systems—specifically, in our analogy's maintenance management information systems—which drive the collective efforts of thousands of technicians across Air Force flightlines on a daily basis.

The Air Force Norm, Value, and Assumption

To meet our service's challenge to “fundamentally change the culture of our Air Force”, we must challenge the assumptions at the base of the Air Force's cultural pyramid to embrace AFSO21 principles.⁷⁰ In turn, the changed assumptions will influence the systems we use, and ultimately transform the behaviors of our personnel. In the case of the missing tool, the core value, assumption, or belief that must be targeted is the notion that AFSO21 is a passing fad, or a management philosophy *du jour* that will fade away with the next administration and/or Chief of Staff. As a result, our espoused beliefs expressed in the systems and policies at the intermediate level haven't reflected AFSO21. If this is the case, our implementation of cultural change is stuck at the artifact level of rhetoric, banners, slogans, and glossy brochures. Without addressing our policies and systems, we'll never reach the foundation of cultural change—the underlying assumptions.

Minimal Reference to AFSO21 in Maintenance Policy Directives

The maintenance information system described in paragraphs above doesn't possess the data elements needed to reflect AFSO21 principles. Using maintenance management policy as barometer, lack of evidence at the policy level also suggests we remain at Schein's Artifact level. If one searched the "maintenance bible," Air Force Instruction 21-101, for the word "Lean", "Six Sigma", "Theory of Constraints", "AFSO21", or related terms, one would find only six sentences referring to these terms in this volume of 463 pages. The five sentences briefly describe "Smart Ops 21" and offer encouragement to implement it through major commands by stating simply, "Lean Maintenance managers at all levels are encouraged to apply Smart Ops 21 principles to their work activities."⁷¹ Similarly, if a depot maintenance civilian worker were to check his "bible", Air Force Instruction 21-102, he or she would find no reference to these terms.⁷² Unless hidden elsewhere in maintenance policy, one may conclude that AFSO21 may not have permeated into the Espoused Beliefs and Values level of Schein's pyramid.

Info Systems at the Crossroads of Transformation Theory

Leveraging information technology in our systems may be the right solution to supply the missing tool and to imbed AFSO21 values in our organization. The Air Force's transformational element of "Management Infrastructure" and Schein's intermediate level of "Policies and Systems" are only two of many references to information systems in several organizational change models. Several more follow.

Beer's Organizational Change Model

Michael Beer's organizational change model for leaders includes the alignment of Vision, Culture, Structure, **Systems**, and Capabilities. According to Linnean's research, any imbalance between these five elements diminishes the system's ability to effectively accomplish its purpose

and causes conflict within the system.⁷³ Linnean argues that systems are an important element that must be considered in bringing about change in any organization. Notwithstanding the other elements, the absence of value stream references in our policies and systems suggests a possible system imbalance.

Business Process Re-Engineering (BPR)

Authors Hammer and Champy devote a portion of their book, *Reengineering The Corporation*, exclusively to technology with a chapter entitled “The Enabling Role of Technology.”⁷⁴ In its text, state-of-the art **information technology** is deemed an “essential enabler” to any transformed process.⁷⁵ So far, the logistics community has worked within antiquated information systems to implement AFSO21 and has not addressed this essential enabling capability.

Computer Science Corporation’s Business Diamond

The Computer Science Corporation, a contractor using business process reengineering methodology to implement logistics transformation, anchors one of the four corners of its BPR model with information systems. Labeled the “CSC Business Diamond,” this model’s four corners include: a) Beliefs, Values, and Norms; b) **Information Technology and Systems**; c) Organization, Jobs, Skills; d) Management and Control Systems.⁷⁶ The center of the diamond relates the business processes influenced by each of its four corners. Prominently featured in the center are “Process Flows” which are tantamount to AFSO21’s value streams.⁷⁷ These central elements further acknowledge the role of information technology in process improvement, or in this case, process reengineering.

Using Info Systems to Influence Culture Change

“Don’t fight the system. Change the rules and the system will change itself.”
 --Gene Bellinger, *Bureacracy and Organizational Politics*

Schein’s Primary Embedding Mechanisms

In the figure below, Schein lists several mechanisms leaders can use to embed new assumptions in an organization.

PRIMARY EMBEDDING MECHANISMS	SECONDARY EMBEDDING MECHANISMS
What leaders pay attention to, measure, and control regularly	Organizational design and structure
How leaders react to crises and events	ORGANIZATIONAL DESIGN AND STRUCTURE
How leaders allocate resources	Rites and rituals of the organization
Deliberate role modeling, teaching, and coaching	Design of physical space, facades and buildings
How leaders allocate rewards and status	Stories about important events and people
How leaders recruit, select, promote, and excommunicate	Formal statement of organizational philosophy, creeds, and charters

Figure 3. Primary and Secondary Embedding Mechanisms

The secondary embedding mechanism of **Organizational Systems and Procedures** is highlighted as the focus of our discussion and as a central element in Air Force bureaucracy and culture. New culture starts with strategic leadership. According to Schein, “Leadership is originally the source of the beliefs and values that get a group moving in dealing with its internal and external problems.”⁷⁸ From there, at the base of the pyramid, culture bubbles up into the intermediate level of policies and systems, and then into organizational artifacts and behaviors.

Consider for a moment the primary mechanisms and their implementation in our Air Force’s recruiting system, promotion system, resource management system, training system, discipline systems, mentoring systems, awards systems and quality force programs—only a few Air Force system examples directly related to this column. In the personnel system, for instance, the underlying Air Force values of “Service Before Self,” “Integrity First,” and “Excellence in All We Do” at the bottom of Schein’s pyramid are built into the system policies enforced by our

leaders. In turn, these policies influence the expected behavior, motivation and discipline in our Air Force culture. In the opposite direction, the artifact level's visible forms, reports and products produced by the system reflect and reinforce these values. In either case, the system is the central layer through which all culture change flows.

Another interpretation the flow of cultural change within the pyramid is that it can be two-way street. "If what leaders propose works, and continues to work, what were once only the leader's assumptions gradually come to be shared assumptions."⁷⁹ The subtle implication here is that cultural change can flow both directions within the pyramid, and that systems and policies, if successful, can replace underlying assumptions at the base of the pyramid. Using this logic, leaders can craft systems to influence cultural assumptions. Of course, the assumed gamble is that these systems must prove successful. Perhaps a lack of evidence of success explains why there are some who have not committed to AFSO21. For others, AFSO21 success may explain why they were converted into Lean believers. Regardless of their present station in their journey, organizations progress through several phases to achieve cultural transformation.

Schein's Stages of Cultural Change

Schein's book *Organizational Culture and Leadership* provides three stages of organizational change as seen in figure 4.⁸⁰

EARLY STAGES
Incremental change, evolution: natural progression and improvement over time
Insight/training: cultural awareness, reflection, assessment, and adjustments
Hybrid solutions: environmental changes that force transformational change
MIDLIFE STAGES
Systematic promotion from subcultures: overall culture biased toward one subcultures
Technological seduction
Infusion of outsiders
MATURE STAGES
Scandal and explosion of myths
Turnarounds
Mergers and acquisitions
Destruction and rebirth

Figure 4. The Three Stages of Transformation

The Air Force's Position Report

Previous anecdotes and observations in this paper have provided evidence to identify the Air Force's stage in cultural change. Many AFSO21 experiments represent the first stage's incremental changes and an evolution in AFSO21 activities. Certainly, a great deal of training has been conducted and insight gained in the initial deployment of AFSO21. Some of these events have produced "homegrown" and/or redundant tracking, control, or reporting systems that represent the "hybrid solutions" at the end of Schein's "Early Stage" of cultural change.

In the "Mid-life Stage", the logistics community has systematically promoted AFSO21 principles through the practice of lean for several years. Assessment of successes in this arena and the subsequent adoption of Lean principles in the Air Force's AFSO21 program represents a "systematic promotion from selected subcultures." The Air Force, and especially the logistics community, is now poised to enter the next step on our journey, the midlife step of "technological seduction."⁸¹

Culture Change through Technological Seduction

“One of the less obvious ways in which the leaders of mid-life organizations change cultural assumptions is through subtle, cumulative, and sometimes unintended impacts of new technology that they introduce deliberately. Technological seduction involves the deliberate, managed introduction of specific technologies for the sake of seducing an organization’s members into new behavior, which will, in turn require them to re-examine their present assumptions and possibly adopt new values, beliefs and assumptions.”⁸²

In Schein’s view, culture change occurs as followers learn what leaders consistently “pay attention to” and “deal with systematically” on a regular basis.⁸³ “The most visible parts of life in any organization are the daily, weekly, monthly, quarterly, and annual cycles of routines, procedures, reports, forms, and other recurrent tasks that have to be performed.”⁸⁴ For the technician in the missing tool analogy, the aircraft forms binder and MDC systems drive the daily cycle of activity of maintainers. If the organization’s desired norms are reinforced frequently and repeatedly in maintenance information systems, these systems can influence the organization’s assumptions to effect cultural change and ultimately, transformation. By extension, perhaps other Air Force systems can as well.

Conclusions

“The Devil’s in the Details” --author unknown

“God is in the details,” --often attributed to the architect Le Corbusier

The two quotes above describe both the frustration and the beauty that can be found in the smallest components of any endeavor. The research and analogies in this paper provide a glimpse into some of the tactical level details where “the devil” may be hiding along the Air Force’s journey on the road to transformation. We explored how our senior Air Force leadership

has postured AFSO21 implementation at the strategic level. Using the logistics community as an example, we saw how the operational level has been equipped with some of the basic tools and techniques to work within existing rigid systems, broaden our focus, and win over Generation TQM. Through the missing tool analogy, we learned that managing and executing AFSO21 value streams might benefit from a new tool deployed in the tactical level environment where our lowest-level technicians operate on a daily basis. At this level, implementation of AFSO21 initiatives can present redundancies and hybrid systems that are less than efficient. It is at this point that an alternative concept was introduced which blends and links daily tasks with the value stream and AFSO21 culture in the context of an information management system. In this alternative future state, the value stream is incorporated into the daily paperwork of systems like maintenance data collection. By giving our information systems a forward-look into the value stream and relying on increasingly intelligent technicians to make value-stream advancing decisions at the lowest level, both value stream performance and job satisfaction could be enhanced. If AFSO21-engineered initiatives are non-intrusive, successful, and persistent, the system that could also influence culture and transformation. In exploring the theory of culture change and relating these systems to Schein's theories, it becomes apparent that systems might be able to influence cultural assumptions. If such a system would eliminate the waste of hybrid solutions, expose nebulous value streams, or facilitate a system of empowered workers entrusted to make decisions and prove successful over time, deploying such a system at the intermediate level of Schein's pyramid will influence basic cultural assumptions. Systems are a recurring theme in multiple organizational change models, and as such, should become a focal point of our AFSO21 efforts. There is also evidence that we are at the right station on our journey to implement new technology solutions to continue on a path toward mature organizational change.

Whether you accept that information systems can be useful in influencing culture or not, one thing is remains certain: if AFSO21 principles are not visible in daily processes of our tactical technicians, we are missing an opportunity to reinforce AFSO21 concepts to every technician at every roll call on a daily basis. If leaders do pay attention to AFSO21 on a regular basis by incorporating AFSO21 into our information systems, we can dispel the assumption that AFSO21 is not here to stay. Ultimately, AFSO21 values will permeate completely to the tactical and basic assumption level of Schein's pyramid. When they do, "God will be in the details."

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